Core 203-003 - Great Ideas of Modern Mathematics
Dr. Patterson - Fall 2014
MW 4-5:30pm (Section 3)

"The universe stands continually open to our gaze, but it cannot be understood unless one first learns to comprehend the language and interpret the characters in which it is written. It is written in the language of mathematics."
> – Galileo Galilei

"The study of mathematics, like the Nile, begins in minuteness but ends in magnificence."
> – Charles Colton

What is "Great Ideas of Modern Mathematics?"
The Oglethorpe University Bulletin states:

> This course explores major modern mathematical developments and helps
> students to understand and appreciate the unique approach to knowledge employed
> by mathematics. The course is organized around three major mathematical ideas
> that have emerged since the time of Sir Isaac Newton. These three ideas may
> be drawn from: game theory, graph theory, knot theory, logic, mathematics of
> finance, modern algebra, non-Euclidean geometry, number theory, probability,
> set theory and the different sizes of infinity, and topology. Students will learn
> how to solve basic problems in the three areas covered in the course and how
> to present their solutions concisely, coherently, and rigorously.

The mathematics we explore in this course include a gentle introduction, logic, graph theory, and probability theory. As we explore these ideas, emphasis will remain on learning how to solve and show you understand basic problems in these areas. Standard grading policy in this course will provide half *or less* of the points for a correct answer and half *or more* of the points for correct support of that answer. After all, the correct answer is useful only because it has a believable argument supporting it.

Course Information
Meeting Time: Monday and Wednesday, 4-5:30pm
Location: Hearst 208
Required Textbook: *Mathematical Excursions* by Aufmann et al. (3rd Edition)
WebAssign Course Key: **oglethorpe 3271 9985**

Contact Information
Instructor Name: Brian Patterson
Office: 313 Lupton Hall
Telephone #:   404-504-1322
E-mail: bpatterson@oglethorpe.edu
Web Site: http://www.oglethorpe.edu/faculty/~b_patterson
Office Hours: M   2:30-3:30

	T	11:30-1pm	
	W	2:30-3:30	
	Th	2:30-5pm	*or By Appointment!*

 Note: Dr. Patterson is available via e-mail/Moodle at any time!

Overview of Course Content
1. Logic (Ch. 3)
2. Graph Theory (Ch. 5)
3. Probability & Combinatorics (Ch. 12)

Coherence of Course General Education Goals
This course contains instruction that is directly relevant to the following general education goals, as stated in the University *Bulletin*:

1. The ability to read critically – to evaluate arguments and the evidence and to draw appropriate conclusions,
2. The ability to convey ideas in writing and in speech – accurately, grammatically, and persuasively,
3. Skill in reasoning logically and thinking analytically and objectively about important matters.

Meeting these goals is accomplished throughout an Oglethorpe education and is assisted in this course via its course learning objectives below.

Course Learning Objectives
After the successful completion of this course, a student will be able to solve problems and write mathematical solutions which demonstrate each of the learning objectives below.

Formal Logic
- Identify whether a mathematical sentence is a statement
- Classify the type of compound statement
- Represent a compound statement using formal logic symbols
- Construct a truth table for a compound statement
- Construct the negation of a compound statement
- Distinguish between universal and existential quantifiers
- Decide whether two statements are equivalent
- Decide whether a statement is a tautology
- Decide whether a statement is a contradiction
- Separate a given conditional into its hypothesis and its conclusion
- For a given conditional, write its inverse, converse, and contrapositive
- Express a given conditional in its equivalent disjunctive form
- Express a given conditional in an equivalent simple English form
- Decide whether an argument is valid via truth table
- Decide whether an argument is valid via reduction to standard logic forms
- Decide whether an argument is valid via Euler Diagram
- Demonstrate the two classical fallacies by creating real-world examples.

Mathematics of Graphs
- Identify basic characteristics of a graph.
- Decide whether two graphs are equivalent.
- Identify whether a graph has an Euler Circuit or Walk.
- Given a weighted graph, construct a table efficiently listing this information.
- Find the shortest route on a weighted graph using the greedy or edge-picking algorithm.
- Find the minimal spanning tree of a weighted graph.
- Identify whether a graph is planar.
- Decide whether a graph is 2-colorable.
- Describe methods for deciding if a graph is n-colorable (for n > 2).

Probability and Combinatorics
- ➢ Count by: listing, using a table, using a tree diagram using a Venn Diagram, using the Fundamental and General Principles of Counting, using combinations, and using permutations
- ➢ Distinguish between counting with replacement and counting without replacement
- ➢ Calculate probabilities exactly by: sample space, counting, rules, Venn Diagram, table, and tree diagram
- ➢ Approximate probabilities by empirical/experimental methods
- ➢ Convert between odds and probability (and vice-versa)
- ➢ Decide whether two events are disjoint
- ➢ Decide whether two events are independent
- ➢ Calculate conditional probabilities via the definition, tables, and Venn Diagrams

Course Letter Grade
Course averages will be calculated using these percentages:

Reading Responses	5 %
Quizzes	25 %
Highest Two Exams	60 %
Lowest Exam	10 %

Each part of your grade will be curved in the following fashion: The student with the highest grade in that section gets a 100% for that section and all other student grade's in that section are scaled accordingly. For example, if you got 220 homework points out of 300 but the best anyone got was 250 homework points, your homework grade would be a 220/250 = 88%. This is done to remove the effect of "bad" questions and overly-long exams.

Letter grades will be assigned according to the University scale:

A	93-100	C+	77-79
A–	90-92	C	73-76
B+	87-89	C–	70-72
B	83-86	D+	67-69
B–	80-82	D	60-66
		F	59 and below.

Attendance and "Flipped" Classrooms
I feel strongly that regular attendance and participation is vital for your learning and your success in this course. Collegiate mathematics proceeds at a pace that makes regular class attendance a necessity. Oglethorpe's *Bulletin* admonishes: "Regular attendance at class sessions, laboratories, examinations, and official University convocations is an obligation which all students are expected to fulfill."

More than this, because this class will take a "flipped" approach to teaching and learning, most of the practice you will receive will be done in class. Missing class means that, not only do you miss the material in the reading, but you also miss the chance to hear the common errors and make mistakes on your own.

This course will have a simple attendance policy: You have 5 absences. You and your advisor will be contacted when you have 5 absences and your overall grade will drop by a full percentage point for each absence after that. For example, a student with a 90% in the class and 6 absences would get an 89% in the class and a student with a 70% (C-) with 7 absences would drop to a D+ (68%).

The point of this policy is that you are not in class learning and participating. This is a bad thing - I do not care why you are not there, the fact remains that you are not there. I also emphasize that missing class is not a good idea in any case, for any reason - it would be wonderful if you make it to class every day. There is no such thing as an absence that "doesn't count" in this class. You can miss it to compete in a sporting event, take a test in another class, or complete other important tasks **but it will still "count" as an absence.**

If you are unable to attend class and there is a test, please contact me **ahead of time** as soon as possible via e-mail or Moodle message directly. **Having a classmate tell me does not suffice.** If you are sick, fire up your e-mail. If you are out of town, call or e-mail me ahead of time. I must hear from you before the due date or exam or you will be assigned a zero for the event.

A special note on lateness: I start taking attendance at the time of class start according to the Oglethorpe schedule. If you are not present when I call your name during attendance, then you are absent – I will not interrupt class to mark you present. If you are concerned about whether you were marked present, please consult with me **after** class (not during!). This lateness policy exists because I make many important announcements and give reminders at the start of class – even if you are late, you are responsible for any announcements made so I like to have a lateness policy that encourages your presence!

If you know you will often be late to class, need to leave early, or other attendance-related issue (such as knowing you will miss more than the allowed number), please contact me individually outside of class time so we can make any arrangements needed. My primary goal is to spend as little time worrying about attendance as possible, especially during class time.

Classroom Etiquette and "Flipped" Classrooms
Most of our class time will be taken up working on problems so it is essential that you bring your book (physical or electronic version) and notes to class every day. Because of the active approach, you are required to participate in the class – while some students are initially hesitant, almost all benefit from this approach.

This means that, if you are doing any activity that serves to distract other students from the learning activity at hand, then you not only are hurting other's chance at learning but disturbing the classroom environment conducive to learning. My policy is that I will warn you that your activity is distracting first then eject you from the classroom for the day if you continue. Everyone taking this class has the right to an undistracted learning environment.

Disabilities/Learning Disabilities
In keeping with the university's policy of providing equal access for students with disabilities, any student with a disability who needs academic accommodations is welcome to meet with me privately. All such conversations will be kept confidential. Such a conversation is required in order to receive accommodations. Students requesting any accommodations will also need to contact the Academic Success Center (ASC). The ASC will conduct an intake and, if appropriate, the office will provide an academic accommodation notification letter for you to bring to me. **Note that accommodations start when I receive such a letter and are not retroactive.** Please contact the ASC at disabilityservices@oglethorpe.edu or visit them in the basement of the Weltner Library to discuss accommodations.

Course Work

There are three parts to out-of-class work in this course:
- Readings
- Quizzes
- Exams

This course has a required reading grade assessed through a reading response. The goal of the reading response is to expose you to the area before class **and** help me find out what areas are troublesome for students. For each week, there will be a short reading assignment, usually from the textbook. Moodle will contain a definitive and updated list of what readings are to be completed before every week of classes. This will be enforced through graded reading responses before each class (also on Moodle).

Each response must have **two** chosen from these four these parts:[1]
1. Parts of the reading you did understand, citing *at least* two specific topics or examples.
2. Parts of the reading you did not understand, citing *at least* two specific topics or examples.
3. A *new* and *specific* exercise you have made up and answered based on the material in the reading.
4. If you did not understand the reading to sufficient degree, explain in prose exactly your understanding of the section from the start to where you first got lost.

Each reading response will be **due by 9pm the night before the class the reading is for** (usually Sunday or Tuesday night). This gives the instructor time to review your responses and alter the class discussion and activity as needed. Each person who responds will receive full credit if it meets the above criteria (instructor's discretion as to what "counts" for each part but I am lenient).

*Late responses will receive **no** credit.* Part of the purpose of the reading assignment is to prepare both of us for class and that purpose is not met with late responses, regardless of the reason for the lateness. Exact readings will be posted well enough ahead of time (at least one full week) that you can complete your reading and response well before any possible time conflict.

There will be readings before the review class of a slightly different structure I will explain in class and through Moodle/e-mail.

Note: The following describes Classwork and Quizzes. Both can be found on WebAssign (which is not Moodle). Go to webassign.net and follow the instructions there or in your book, using the class code on the first page of this syllabus or on Moodle when prompted.

Classwork is not graded, but completion of the work is essential for (1) maximizing the effectiveness of study time spent in class and (2) preparing for the quiz described below. Classwork assignments can be attempted as many times as you choose until you have mastered a topic, and all questions and accompanying tutorials are visible throughout the entirety of the course.

Daily quizzes are completed outside of class time after every class (except before and after the day of any exam). Like classwork, you can redo quizzes as often as you would like but there are two important qualifications: (1) if you want to redo the quiz, you must redo the entire quiz (including questions you may have already gotten right) and (2) the problems may differ each time you take the quiz and/or have slightly altered questions. For example, a question asking you to solve $9x+1=0$ may ask you to solve $7x+2=0$ the next time. Thus, you should not begin a quiz until you have a significant amount of uninterrupted time to complete it!

---

1 You may do three or all four methods for your own benefit but this is not worth extra credit.

All quiz assignments will open by 7:00pm (or earlier) and close for submission at 4pm (no later!) on the afternoon of the next class meeting. Quizzes on WebAssign will have 5 questions worth 1 point each (which is added to the write-up 5 points I will explain shortly).

No resources other than calculators are allowed on the quizzes. If you use resources other than a calculator (e.g. your book), you are not preparing yourself well for the exam. All exams are written as if you only used a calculator to complete your quizzes!

In addition, each student will physically submit complete written work for one problem from each quiz (of his or her own choosing) which will be graded on the quality of mathematical argument. You must include the full question asked and clearly delineate your answer from your work as basic steps. Grades for the written work are assessed on the following 5-point scale:

5 points—Very Good   (work that is careful and thorough, with clear reasoning and communication; could potentially serve as a model for other students)
4 points—Good   (good, solid work with only minor gaps in reasoning or communication)
3 points—Satisfactory   (work that has merit but contains significant shortcomings in reasoning and communication)
2 points—Unsatisfactory   (work that shows effort but contains serious flaws in reasoning or communication)
1 points—Failing   (work submitted but contains irrevocable flaws in reasoning and execution)
0 points—Did not submit

Students **may also** elect to submit one problem graded as "incorrect" on the WebAssign part of the quiz for partial credit consideration. If it is determined that the calculation error was minor and the mathematical argument is still acceptable, then the student will be award partial credit for the problem. Otherwise, **do not assume** the instructor will inspect your WebAssign quiz answers.

A note on extensions for quizzes: Whenever possible, complete WebAssign quizzes and turn in write-ups on time. It is OK to occasionally send your write-ups in with other students if you cannot attend class or turn in write-ups through e-mail. All requests for extension must be through e-mail (not through talking to me or WebAssign message). To discourage regular use of extensions, I have a policy of granting at most 5 extensions per semester per student - WebAssign makes when I grant extensions very easy to track so keep this in mind when requesting an extension for an assignment (it is sometimes better to do what you can and move on to the next section - consult the instructor about this).

There will be three tests: **October 1st, October 22nd,** and **December 15th**. Tests will cover material from class, homework problems, and your readings. It will be a physical test taken during class time in our usual classroom. All tests are non-cumulative in that they focus on topics in one of the three main areas - however, knowledge of prior sections may be assumed incidentally. **The examinations will be graded more leniently than the homework.**

The mandatory **final examination** is simply your third test: **December 15th, 4-5:30pm**. Note that our third exam will be 90 minutes (as are all other exams) so be present at the time printed above and in the calendar below. This final exam may be taken **neither** early **nor** late; no exceptions are allowed to the University's Final Examination Schedule.

Missing a test is a very serious and grave matter. I do not automatically give "make-up" tests. There are several options that I may choose depending on the circumstance. A student should discuss the circumstances of such an absence with me in-person, in my office (preferably in advance) so that we may begin handling this situation. In order not to receive a zero for a missed test, a student must: (1) inform me within four hours of the test's start of

the reason the test was missed and (2) provide me with sufficient documentation, i.e. doctor's note, court document, etc. If either condition is not met, then the student will receive a zero for the missed test. Any allowed make-up options must be arranged and accomplished as soon as possible.

Incompletes

The following is University policy:

The grade of "I" has the same effect as an "F" on the GPA. If a student is unable to complete the work for a course on time for reasons of health, family tragedy, or other circumstances the instructor deems appropriate, the grade of "I" may be assigned.

If the student completes the work within thirty days of the last day of exams (of the semester in question), the instructor will evaluate the work and turn in a revised grade. Any "I" not changed by the professor within forty-five days of the last day of exams will automatically be changed to a grade of "F."

Withdrawal

After the drop/add period ends on August 25, a student may withdraw from this class before its completion and will earn either a W (withdrawn) or a WF (withdrawn failing) according to the guidelines below.
- If all paperwork is *processed* by the Registrar's Office by October 20, then a student will earn a W.
- Between October 21 and the end of the semester, a student will automatically earn a WF.

Moodle

As noted above, Moodle will be used extensively in this course. Students are responsible for checking the Moodle homepage for this course regularly for announcements, reading assignments, and homework/exam information. It is your responsibility to know how to login, use the discussion boards for reading response, etc. Do not wait until a reading response deadline to learn how to do these tasks. Click on Help after you log in if you have not used Moodle before, and familiarize yourself with its functionality.

I also encourage students to post questions and answer each other's questions in Moodle's discussion forum. I will happen by whenever I can to clarify.

Social Networking Websites

Though Facebook and other social networking websites are valuable ways to stay connected with friends in this digital age, they are not appropriate avenues through which to communicate about our class. While we have a professional relationship in class, I will neither communicate with you in any way on such websites nor accept any "friend requests" from you. If you are currently "my friend," I will terminate that online relationship for the duration of our class. The appropriate venues for our communication are: the classroom, my office, Moodle, OU voice-mail, and OU e-mail. Note that WebAssign messages are NOT a reliable mode of contacting me. The only exception to this rule is the LinkedIn website - this is a professional networking site that I would be happy to provide recommendations on.

Grading Appeals

Quizzes and examinations will be graded as soon as possible, generally not more than a week. I will include written justification for your score. Quiz comments will be returned as written on your write-ups while exams will be returned in class.

For each quiz, there will be a limited period in which to appeal your score. You have one week after the graded results have been returned to you via Moodle to appeal your score. Make appeals directly to the instructor during office hours or email the instructor to arrange a meeting if you cannot attend his or her office hours. After the appeal period has ended, the score will stand as is.

For exam appeals, there is a much more formal process. There will be a one-week window of appeal for each test beginning the day the exam is returned in class (whether or not you receive your exam on that date). An exam appeal must be **in writing** and provide information to include the number of the question under issue and a brief statement giving the reason for the appeal. This written statement and the original exam must be given to the instructor during the specified appeal period.

Here are some appealable and non-appealable examples:

Appealable	Not Appealable
Your answer on an exam is unclear and it is interpretable in a better light.	Your answer on a quiz write-up is unclear and it is interpretable in a better light.
My comments reflect me not understanding your approach to the problem. You provide an explanation of what you were talking about.	You agree entirely with my comments but believe that the number of points lost due to those comments was too many.
	You were sick on the day of the test but still took it.
	You have a documented learning disability but did not notify me prior to the exam.
	You would like / need a better grade for reasons not related to the topics in the class.

Approximate Course Schedule

(Schedule will be altered during the semester by the professor and is presented here only as a guideline)

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8-18 Course Intro Pretest	8-19	8-20 Section 3.1	8-21	8-22
8-25 **Last Drop/Add** Section 3.2a	8-26	8-27 Section 3.2b	8-28	8-29
9-1 **Labor Day**	9-2	9-3 Section 3.3a	9-4	9-5
9-8 Section 3.3b	9-9	9-10 Section 3.4	9-11	9-12
9-15 Section 3.5a	9-16	9-17 Section 3.5b	9-18	9-19
9-22 Section 3.6a	9-23	9-24 Section 3.6b	9-26	9-27
9-29 **EXAM REVIEW**	9-30	10-1 **EXAM 1**	10-2	10-3
10-6 Section 5.1	10-7	10-8 Section 5.2	10-9	10-10 **MIDPOINT OF SEMESTER**
10-13 **FALL BREAK**	10-14 **FALL BREAK**	10-15 Section 5.3 + MSTs	10-16	10-17
10-20 **WF After Today** Section 5.4	10-21	10-22 **EXAM REVIEW**	10-23	10-24
10-27 **EXAM 2**	10-28	10-29 Section 12.1	10-30	10-31
11-3 Section 12.2a	11-4	11-5 Section 12.2b	11-6	11-7
11-10 **Spring Registration Starts** Section 12.3	11-11	11-12 Section 12.4a	11-13	11-14
11-17 Section 12.4b	11-18	11-19 Section 12.5a	11-20	11-21
11-24 Section 12.5b	11-25	11-26 **THANKSGIVING**	11-27 **THANKSGIVING**	11-28 **THANKSGIVING**
12-1 Section 12.5c	12-2	12-3 **EXAM REVIEW**	12-4	12-5
12-8 **Last Day of Classes** **EXAM REVIEW 2**	12-9 **READING DAY**	12-10	12-11	12-12
12-13	12-14	12-15 **EXAM 3** 4-5:30 pm		

Honor Code

Persons who come to Oglethorpe University for work and study join a community that is committed to high standards of academic honesty. The honor code contains the responsibilities we accept by becoming members of the community and the procedures we will follow should our commitment to honesty be questioned.

The students, faculty and staff of Oglethorpe University expect each other to act with integrity in the academic endeavor they share. Members of the faculty expect that students complete work honestly and act toward them in ways consistent with that expectation. Students are expected to behave honorably in their academic work and are expected to insist on honest behavior from their peers.

Oglethorpe welcomes all who accept our principles of honest behavior. We believe that this code will enrich our years at the University and allow us to practice living in earnest the honorable, self-governed lives required of society's respected leaders.

Our honor code is an academic one. The code proscribes cheating in general terms and also in any of its several specialized sub-forms (including but not limited to plagiarism, lying, stealing and interacting fraudulently or disingenuously with the honor council). The Code defines cheating as "the umbrella under which all academic malfeasance falls. Cheating is any willful activity impacting or connected to the academic enterprise and involving the use of deceit or fraud in order to attempt to secure an unfair advantage for oneself or others or to attempt to cause an unfair disadvantage to others. Cheating undermines our community's confidence in the honorable state to which we aspire."

The honor code applies to all behavior related to the academic enterprise. Thus, it extends beyond the boundaries of particular courses and classrooms per se, and yet it does not extend out of the academic realm into the purely social one.

The honor code is in force for every student who is enrolled (either full- or part-time) in any of the academic programs of Oglethorpe University at any given time. All cases of suspected academic dishonesty will be handled in accordance with the provisions established in this code. The honor council has sole jurisdiction in matters of suspected academic dishonesty. Alternative ways of dealing with cases of suspected academic fraud are prohibited. In cases of alleged academic dishonesty on the part of students, the honor council is the final arbiter.

For the following discussion, use the following definitions:
Cheating:
      a.   The unauthorized possession or use of notes, texts or other such materials during an examination.
      b.   Copying another person's work or participation in such an effort.
      c.   An attempt or participation in an attempt to fulfill the requirements of a course with work other than one's original work for that course.
Plagiarism:
      Plagiarism includes representing someone else's words, ideas, data or original research as one's own, and in general failing to footnote or otherwise acknowledge the source of such work. One has the responsibility of avoiding plagiarism by taking adequate notes on reference materials, including material taken off the internet or other electronic sources, used in the preparation of reports, papers and other coursework.

In general, it is acceptable to discuss how to do the homework with other students, but when it is time to sit down and write your solution, you must be able to produce the entire homework without help from anyone else. Please also note that the person providing this help may be in trouble if they provide too much help. That is, if you work together with someone, it is in your best interest that they also can produce the entire homework without help from anyone else. If you have trouble completing the homework on time, please contact me instead of cheating.

Part of college is learning to mange your time to complete the requirements placed on you without resorting to dishonorable means.

Here are some useful dos and don'ts specifically for this course:
Do:
- Bring extra pencils to a test. (Extra paper is provided)
- Discuss Classwork problems with friends.
- Based on your understanding, complete your quiz write-up individually.
- Cite any sources used in completion of the quiz write-up (including web sites). (although such resources should not be used at all on quizzes, it is better to be in the habit of citing resources used)
- Share solutions that were done as a formal exercise, or that was presented in class, the textbook, or Classwork exercises on WebAssign.

Don't:
- Use notes, texts, communication devices, or similar materials during a test.
- Use an unauthorized calculator during a test.
- Copy another person's completed quiz write-up.
- Copy any part of another person's partial quiz write-up.
- Copy solutions from any source (including web sites) and turn it in.
- Copy solutions from any source (including web sites), modify it slightly, and turn it in.
- Allow another student to copy your work (which includes posting your complete answers on Moodle)
- Uploading or otherwise copying your work to an unauthorized web site or location.
- Type in one solution together and turn in two copies.
- Write one solution together on paper and turn in two copies after you each type it in.
- Forging or deliberately misrepresenting data or results.
- Making unauthorized copies of graded work for future distribution.
- Lying about the reason for an absence to receive an extension on an exam or on a homework's due date.
- Violating the specific directions concerning the operation of the honor code in relation to a particular homework or exam.
- Claiming credit for a group project to which one did not contribute.
- Fraudulent interaction on the part of students with the honor council, such as: Willfully refusing to testify after having been duly summoned; failing to appear to testify (barring a bona fide last-minute emergency) after having been duly summoned; testifying untruthfully.
- Other types of plagiarism, lying, or stealing as defined in the Honor Code.

The honor code is in force for every student who is enrolled (either full- or part-time) in any of the academic programs of Oglethorpe University at any given time. All cases of suspected academic dishonesty will be handled in accordance with the provisions established in this code. The honor council has sole jurisdiction in matters of suspected academic dishonesty. Alternative ways of dealing with cases of suspected academic fraud are prohibited. In cases of alleged academic dishonesty on the part of students, the honor council is the final arbiter.